420E, 430E, 432E, 434E, 442E, AND 444E BACKHOE LOADERS

Maintenance Intervals
### Maintenance Interval Schedule

**SMCS Code:** 7000

Ensure that all safety information, warnings and instructions are read and understood before any operation or any maintenance procedures are performed.

The user is responsible for the performance of maintenance, including all adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components.

Use mileage, fuel consumption, service hours, or calendar time, WHICH EVER OCCURS FIRST, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance.

**Note:** Before each consecutive interval is performed, all maintenance from the previous interval must be performed.

**Note:** If Cat HYDO Advanced 10 hydraulic oil is used, the hydraulic oil change interval will change. The normal interval of 2000 hours is extended to 3000 hours. S·O·S services may extend the oil change even longer. Consult your Caterpillar dealer for details.

#### When Required

<table>
<thead>
<tr>
<th>Task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery - Recycle</td>
<td>146</td>
</tr>
<tr>
<td>Battery or Battery Cable - Inspect/Replace</td>
<td>146</td>
</tr>
<tr>
<td>Bucket Cutting Edges - Inspect/Replace</td>
<td>148</td>
</tr>
<tr>
<td>Bucket Tips - Inspect/Replace</td>
<td>149</td>
</tr>
<tr>
<td>Cab Interior - Clean</td>
<td>151</td>
</tr>
<tr>
<td>Engine Air Filter Primary Element - Clean/Replace</td>
<td>158</td>
</tr>
<tr>
<td>Engine Air Filter Secondary Element - Replace</td>
<td>159</td>
</tr>
<tr>
<td>Engine Air Precleaner - Clean</td>
<td>160</td>
</tr>
<tr>
<td>Engine Compartment - Clean</td>
<td>160</td>
</tr>
<tr>
<td>Fuses - Replace</td>
<td>172</td>
</tr>
<tr>
<td>Oil Filter - Inspect</td>
<td>178</td>
</tr>
<tr>
<td>Radiator Core - Clean</td>
<td>180</td>
</tr>
<tr>
<td>Window Washer Reservoir - Fill</td>
<td>188</td>
</tr>
<tr>
<td>Window Wipers - Inspect/Replace</td>
<td>188</td>
</tr>
<tr>
<td>Windows - Clean</td>
<td>188</td>
</tr>
</tbody>
</table>

#### Every 10 Service Hours or Daily

<table>
<thead>
<tr>
<th>Task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backhoe Boom, Stick, Bucket, and Cylinder Bearings - Lubricate</td>
<td>145</td>
</tr>
<tr>
<td>Backup Alarm - Test</td>
<td>146</td>
</tr>
<tr>
<td>Braking System - Test</td>
<td>148</td>
</tr>
<tr>
<td>Cooling System Coolant Level - Check</td>
<td>153</td>
</tr>
<tr>
<td>Engine Air Filter Service Indicator - Inspect</td>
<td>160</td>
</tr>
<tr>
<td>Engine Oil Level - Check</td>
<td>161</td>
</tr>
<tr>
<td>Fuel System Water Separator - Drain</td>
<td>171</td>
</tr>
<tr>
<td>Hydraulic System Oil Level - Check</td>
<td>176</td>
</tr>
<tr>
<td>Loader Bucket, Cylinder, and Linkage Bearings - Lubricate</td>
<td>176</td>
</tr>
<tr>
<td>Seat Belt - Inspect</td>
<td>181</td>
</tr>
<tr>
<td>Stabilizer - Clean/Inspect/Replace</td>
<td>182</td>
</tr>
<tr>
<td>Stabilizer and Cylinder Bearings - Lubricate</td>
<td>183</td>
</tr>
<tr>
<td>Swing Frame and Cylinder Bearings - Lubricate</td>
<td>183</td>
</tr>
<tr>
<td>Tire Inflation - Check</td>
<td>183</td>
</tr>
<tr>
<td>Transmission Oil Level - Check</td>
<td>186</td>
</tr>
<tr>
<td>Wheel Nut Torque - Check</td>
<td>188</td>
</tr>
</tbody>
</table>

#### Every 50 Service Hours or Weekly

<table>
<thead>
<tr>
<th>Task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cab Filter (Fresh Air) - Clean/Inspect/Replace</td>
<td>150</td>
</tr>
<tr>
<td>Cab Filter (Recirculation) - Clean/Inspect/Replace</td>
<td>150</td>
</tr>
<tr>
<td>Fuel Tank Water and Sediment - Drain</td>
<td>171</td>
</tr>
<tr>
<td>Parking Brake - Check/Adjust</td>
<td>178</td>
</tr>
</tbody>
</table>

#### Every 250 Service Hours

<table>
<thead>
<tr>
<th>Task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Oil Sample - Obtain</td>
<td>162</td>
</tr>
</tbody>
</table>

#### Every 250 Service Hours or Monthly

<table>
<thead>
<tr>
<th>Task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axle Breathers - Clean/Replace</td>
<td>145</td>
</tr>
<tr>
<td>Belts - Inspect/Adjust/Replace</td>
<td>147</td>
</tr>
<tr>
<td>Differential Oil Level (Front) - Check</td>
<td>156</td>
</tr>
<tr>
<td>Differential Oil Level (Rear) - Check</td>
<td>156</td>
</tr>
<tr>
<td>Extendable Stick Pads - Inspect/Adjust</td>
<td>163</td>
</tr>
<tr>
<td>Final Drive Oil Level (Front) - Check</td>
<td>168</td>
</tr>
<tr>
<td>Final Drive Oil Level (Rear) - Check</td>
<td>169</td>
</tr>
<tr>
<td>Power Sideshift Stabilizer Wear Pads - Inspect</td>
<td>179</td>
</tr>
<tr>
<td>Sideshift Stabilizer Wear Pads - Inspect/Adjust</td>
<td>182</td>
</tr>
</tbody>
</table>

#### Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems)

<table>
<thead>
<tr>
<th>Task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling System Coolant Sample (Level 2) - Obtain</td>
<td>154</td>
</tr>
</tbody>
</table>

#### Every 500 Service Hours or 3 Months

<table>
<thead>
<tr>
<th>Task</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling System Coolant Sample (Level 1) - Obtain</td>
<td>153</td>
</tr>
<tr>
<td>Differential Oil Sample (Front) - Obtain</td>
<td>157</td>
</tr>
<tr>
<td>Differential Oil Sample (Rear) - Obtain</td>
<td>157</td>
</tr>
<tr>
<td>Drive Shaft Spline - Lubricate</td>
<td>157</td>
</tr>
<tr>
<td>Engine Oil and Filter - Change</td>
<td>162</td>
</tr>
<tr>
<td>Final Drive Oil Sample (Front) - Obtain</td>
<td>169</td>
</tr>
<tr>
<td>Final Drive Oil Sample (Rear) - Obtain</td>
<td>169</td>
</tr>
<tr>
<td>Fuel System Filter and Water Separator - Replace</td>
<td>169</td>
</tr>
<tr>
<td>Fuel System Secondary Filter - Replace</td>
<td>170</td>
</tr>
<tr>
<td>Hydraulic Oil Sample - Obtain</td>
<td>173</td>
</tr>
<tr>
<td>Hydraulic System Oil Filter - Replace</td>
<td>175</td>
</tr>
<tr>
<td>Transmission Oil Filter - Replace</td>
<td>185</td>
</tr>
<tr>
<td>Transmission Oil Sample - Obtain</td>
<td>187</td>
</tr>
</tbody>
</table>
Every 1000 Service Hours
Engine Valve Lash - Check ................................. 163

Every 1000 Service Hours or 6 Months
Differential Oil (Front) - Change ........................ 155
Differential Oil (Rear) - Change .......................... 156
Final Drive Oil (Front) - Change .......................... 167
Final Drive Oil (Rear) - Change .......................... 168
Rollover Protective Structure (ROPS) - Inspect .. 181
Transmission Magnetic Screen - Clean .............. 184
Transmission Oil - Change ................................. 184
Wheel Bearings (Front) - Lubricate ..................... 187

Every 2000 Service Hours
Engine Crankcase Breather - Replace ............... 161

Every 2000 Service Hours or 1 Year
Hydraulic System Oil - Change ......................... 174
Receiver Dryer (Refrigerant) - Replace .............. 180

Every Year
Cooling System Coolant Sample (Level 2) -
Obtain .................................................................. 154

Every 3000 Service Hours or 2 Years
Cooling System Water Temperature Regulator -
Clean/Replace .................................................. 155

Every 3 Years After Date of Installation or
Every 5 Years After Date of Manufacture
Seat Belt - Replace ............................................. 181

Every 6000 Service Hours or 3 Years
Cooling System Coolant Extender (ELC) - Add .. 153

Every 12 000 Service Hours or 6 Years
Cooling System Coolant (ELC) - Change .......... 151
Axle Breathers - Clean/Replace

**SMCS Code:** 3278-070-BRE; 3278-510-BRE

Illustration 210
The front axle breather is located on the top right side of the differential housing.

Illustration 211
The rear axle breather is located to the left of the differential housing.

1. Clean the area around the breathers. Remove the breather from the front axle.

2. Wash the breather in clean nonflammable solvent. Wipe the breather dry and check the breather for damage.

3. Install the clean breather back into the axle. Replace the breather if the breather is damaged.

**Note:** Make sure that the slot in the breather is parallel to the axle housing.

Backhoe Boom, Stick, Bucket, and Cylinder Bearings - Lubricate

**SMCS Code:** 6501-086-BD; 6502-086-BD; 6503-086-BD; 6511-086-BD; 6512-086-BD; 6533-086-BD; 7562-086-BD

Illustration 212
Position the backhoe into the service position that is shown above. Lower the bucket to the ground. Relieve the hydraulic pressure.

Illustration 213
Apply lubricant to the grease fitting (1) for the rod end of the stick cylinder.

Apply lubricant to the grease fitting (2) for the head end of the boom cylinder and the head end of the stick cylinder.

Apply lubricant to the grease fitting (3) for the rod end of the boom cylinder.

Apply lubricant to the grease fitting (4) for the boom pivot. There is one grease fitting on each side of the machine.
Apply lubricant to the grease fitting (5) for the bucket pivot pin.

Apply lubricant to the grease fitting (6) for the link.

Apply lubricant to the grease fitting (7) for the rod end of the bucket cylinder.

Apply lubricant to the grease fitting (8) for the head end of the bucket cylinder.

Apply lubricant to the grease fitting (9) for the pivot pin for the stick.

Apply lubricant to the grease fitting (10) for the pivot pin. There is one grease fitting on each side of the machine.

Apply lubricant to the grease fitting (11) for the pivot pin.

Apply lubricant to the grease fitting (12) for the head end of the thumb cylinder.

Apply lubricant to the grease fitting (13) for the rod end of the thumb cylinder.

Apply lubricant to the grease fitting (14) for the pivot pin on each side of the thumb.

There is a total of 21 grease fittings.

Backup Alarm - Test

SMCS Code: 7406

Turn the engine start switch key to ON in order to perform the test.

Apply the service brake. Move the transmission direction control lever to REVERSE position.

The backup alarm should immediately sound. The backup alarm will continue to sound until the transmission direction control lever is moved to the NEUTRAL position or to the FORWARD position.

Battery - Recycle

SMCS Code: 1401-561

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

- A battery supplier
- An authorized battery collection facility
- Recycling facility

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401

1. Turn the engine start switch to the OFF position. Turn all switches to the OFF position.

2. Disconnect the negative battery cable from the frame.

Note: Do not allow the disconnected battery cable to contact the frame of the machine.

3. Disconnect the negative battery cable at the battery.

4. Inspect the battery terminals and inspect the battery cables. Keep the terminals clean and keep the terminals coated with petroleum jelly.
5. Perform the necessary repairs. Replace the cable or the battery, as needed.

6. Connect the negative battery cable at the battery.

7. Connect the battery cable to the frame of the machine.

8. Install the engine start switch key.

Belts - Inspect/Adjust/Replace

SMCS Code: 1357-025; 1357-040; 1357-510

If new belts are installed, check belt adjustment after 30 minutes of operation. For multiple belt drive applications, always replace the belts in matched sets. Replacing only one belt of a matched set will cause the new belt to carry more load because the older belts are stretched. The additional load on the new belt could cause the new belt to break.

1. Install the lift cylinder brace. Refer to Operation and Maintenance Manual, “Lift Cylinder Brace - Connect and Disconnect” for more information.

2. Remove the engine access panel on the left side of the machine.

3. Inspect the condition of the air conditioner belt and the adjustment of the air conditioner belt. The air conditioner belt should deflect 10 mm (0.38 inch) under 110 N (25 lb) of force.

4. Loosen the adjusting locknut (1). Loosen the two compressor bracket mounting bolts (2).

5. Move the compressor until the correct belt tension is reached.

6. Tighten the adjusting locknut (1). Tighten the two compressor bracket mounting bolts (2).

7. Recheck the belt deflection. If the amount of deflection is incorrect, repeat Step 4 to Step 6.

8. Install the engine access panel.

9. Remove the engine access panel on the right side of the machine.

10. Inspect the condition of the alternator belts and the adjustment of the alternator belts. The alternator belts should deflect 10 mm (0.38 inch) under 110 N (25 lb) of force.

11. Loosen the mounting bolt (3). Loosen the adjusting locknut (4).

12. Move the alternator until the correct tension is reached.

13. Tighten the adjusting locknut (4). Tighten the mounting bolt (3).

14. Recheck the belt deflection. If the amount of deflection is incorrect, repeat Step 11 to Step 13.

15. Install the engine access panel.

16. Start the engine. Raise the loader arms to the maximum height.

17. Remove the pin and replace the brace for the loader lift arm to the stored position on the loader lift arm.

18. Lower the bucket to the ground.
Braking System - Test

SMCS Code: 4251; 4267; 7000

Service Brake Holding Ability Test

Check the area around the machine. Make sure that the machine is clear of personnel and clear of obstacles.

Test the brakes on a dry, level surface.

Fasten the seat belt before you test the brakes.

The following tests are used to determine if the service brake is functional. These tests are not intended to measure the maximum brake holding effort. The brake holding effort that is required to sustain a machine at a specific engine rpm varies depending on the machine. The variations are the differences in the engine setting, in the power train efficiency, and in the brake holding ability, etc.

1. Start the engine. Raise the bucket slightly.

2. Apply the service brake. Release the parking brake.

3. Move the transmission control lever to THIRD SPEED FORWARD.

4. Gradually increase the engine speed to high idle. The machine should not move.

If the machine begins to move, reduce the engine speed immediately and apply the service brake pedal.

5. Reduce the engine speed. Move the transmission to NEUTRAL. Lower the bucket to the ground. Stop the engine.

NOTICE
If the machine moved while testing the brakes, contact your Caterpillar dealer. Have the dealer inspect and, if necessary, repair the parking brakes before returning the machine to operation.

Secondary Brake Holding Ability Test

Check the area around the machine. Make sure that the machine is clear of personnel and clear of obstacles.

Test the brakes on a dry, level surface.

Fasten the seat belt before you test the brakes.

The following tests are used to determine if the parking brake is functional. These tests are not intended to measure the maximum brake holding effort. The brake holding effort that is required to sustain a machine at a specific engine rpm varies depending on the machine. The variations are the differences in the engine setting, in the power train efficiency, and in the brake holding ability, etc.

1. Start the engine. Raise the bucket slightly.

2. Engage the parking brake.

3. Move the transmission control lever to THIRD SPEED FORWARD.

Note: The parking brake indicator light should come on and the parking brake alarm should sound.

4. Gradually increase the engine speed to high idle. The machine should not move.

5. Reduce the engine speed. Move the transmission to NEUTRAL. Lower the bucket to the ground. Stop the engine.

NOTICE
If the machine moved while testing the brakes, contact your Caterpillar dealer.

Have the dealer inspect and, if necessary, repair the parking brakes before returning the machine to operation.

Bucket Cutting Edges - Inspect/Replace

SMCS Code: 6801

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket cutting edges.
1. Raise the bucket. Place a block under the bucket.

2. Lower the bucket to the blocking.

   Do not block up the bucket too high. Block up the bucket so that the bucket is high enough to remove the cutting edges and the end bits.

3. Remove the bolts. Remove the cutting edge and the end bits.

4. Clean the contact surfaces.

5. Use the opposite side of the cutting edge, if this side is not worn.

6. Install a new cutting edge, if both edges are worn.

7. Install the bolts. Tighten the bolts to the specified torque.

8. Raise the bucket. Remove the blocks.

9. Lower the bucket to the ground.

10. After a few hours of operation, check the bolts for proper torque.

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

**Bucket Tips - Inspect/Replace**

**SMCS Code:** 6805

**WARNING**

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket tips.

1. Drive the pin out of the bucket tip from the retainer side of the bucket tip. Remove the bucket tip and the retainer.

2. Clean the adapter and the pin.

3. Fit retainer (2) into retaining washer (1). Install this assembly into the groove that is in the side of adapter (3).

(1) Retaining washer  
(2) Retainer  
(3) Adapter
4. Install the new bucket tip or the rotated bucket tip onto the adapter. To allow greater penetration or less penetration, the bucket tip may be rotated by 180 degrees.

5. From the other side of the retainer, drive the pin through the bucket tip, the adapter, and the retainer.

6. After you drive the pin, make sure that the retainer fits snugly into the pin groove.

**Cab Filter (Fresh Air) - Clean/Inspect/Replace**

**SMCS Code:** 7342-040; 7342-070; 7342-510

**NOTICE**

Do not clean the elements by bumping or tapping them.

Inspect the elements after cleaning. Do not use an element with damaged pleats, gaskets or seals.

When cleaning with pressure air, use 205 kPa (30 psi) maximum to prevent element damage by too much air pressure.

When cleaning with pressure water, use 280 kPa (40 psi) maximum to prevent element damage.

Clean the filter element weekly, but clean the filter element daily when there is a reduction of air circulation.

1. Open the filter cover that is located on the right fender.

2. Remove the filter element.

3. Clean the filter element with compressed air or pressure water. Direct the air or the water along the pleats of the element. You can also wash the element with clean water and nonsudsing household detergent.

4. Rinse the filter element thoroughly with clear water.

5. Allow the filter element to air dry. Inspect the element for damage. If the filter element is damaged, replace the filter element.

6. Install the filter element.

7. Install the filter cover.
**Cab Filter (Recirculation) - Clean/Inspect/Replace**

**SMCS Code:** 7342-040; 7342-070; 7342-510

The recirculation filter is located to the left of the operator's seat.

1. Remove the cover that is over the recirculation filter. Remove the filter element.
2. The filter element can be cleaned by using compressed air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
3. Look through the filter toward a bright light. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
4. Install the filter element.

**Note:** Clean the filters more often in dusty conditions.

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**Cab Interior - Clean**

**SMCS Code:** 7301-070

1. Use high pressure air in order to clean the entire cab and the main electrical box.
2. Wash off any remaining dirt and debris. Use caution and minimize the water around electrical connections and the cab roof.
3. Scrub the floormat, the instrument panel, the windows, and the mirrors. Wipe the cab dry.

---

**Cooling System Coolant (ELC) - Change**

**SMCS Code:** 1353; 1395

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**WARNING**

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

---

**NOTICE**

Mixing ELC with other products will reduce the effectiveness of the coolant.

This could result in damage to cooling system components.

If Caterpillar products are not available and commercial products must be used, make sure they have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants and Caterpillar Extender.

**Note:** This machine is shipped with Extended Life Coolant. Extended Life Coolant is recommended for use.

For information about the addition of Extender to your cooling system, see the Operation and Maintenance Manual, “Cooling System Coolant Extender (ELC) - Add” or consult your Caterpillar dealer.

---

**Flushing the Extended Life Coolant From the Cooling System**

Some engines utilize Extended Life Coolant. See the Operation and Maintenance Manual, “Maintenance Interval Schedule” in order to determine the service interval. If a Extended Life Coolant was previously used, flush the cooling system with clean water. No other cleaning agents are required.

---

**Flushing a Standard Coolant From the Cooling System**

If you change the coolant of a machine to Extended Life Coolant from another type of coolant, use a Caterpillar cleaning agent to flush the cooling system. After you drain the cooling system, thoroughly flush the cooling system with clean water. All of the cleaning agent must be removed from the cooling system.
Changing the Coolant

**WARNING**

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.

---

**NOTICE**

Do not change the coolant until you read and understand the material in the Cooling System Specifications section.

Drain the coolant whenever the coolant is dirty or whenever foaming is observed.

1. Install the lift cylinder brace. Refer to Operation and Maintenance Manual, “Lift Cylinder Brace - Connect and Disconnect” for more information.

2. Open the engine access door on the top of the machine.

3. Slowly loosen the radiator cap in order to relieve system pressure. Remove the radiator cap slowly.

4. Remove the access panel on the right side of the engine compartment.

5. Open the drain valve. Face the end of the hose into a suitable container.

6. Close the drain valve. Fill the system with a solution which consists of clean water and of cooling system cleaner. The concentration of the cooling system cleaner in the solution should be between 6 percent and 10 percent.

7. Start the engine. Run the engine for 90 minutes. Stop the engine. Drain the cleaning solution into a suitable container.

8. While the engine is stopped, flush the system with water. Flush the system until the draining water is transparent.

9. Close the drain valve.

10. Add the coolant solution. See the following topics:

    - Operation and Maintenance Manual, “Capacities (Refill)”

**Note:** If you are using Caterpillar antifreeze, do not add the supplemental coolant additive at this time and/or change the element at this time.

11. Start the engine. Run the engine without the radiator cap until the thermostat opens and the coolant level stabilizes.

12. Maintain the coolant level within 13 mm (0.5 inch) of the bottom of the filler pipe.

13. Install the radiator cap. Lower the tab on the radiator cap. Replace the radiator cap if the gasket is damaged.

14. Stop the engine.
15. Replace the access panel. Close the access door.

**Cooling System Coolant Extender (ELC) - Add**

**SMCS Code:** 1352; 1353; 1395

**WARNING**

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen the cap slowly to relieve the pressure.

When a Caterpillar Extended Life Coolant is used, an extender must be added to the cooling system. See the Operation and Maintenance Manual, “Maintenance Interval Schedule” for the proper service interval. The amount of extender is determined by the cooling system capacity.

<table>
<thead>
<tr>
<th>Cooling System Capacity</th>
<th>Recommended Amount of Extender</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 to 30 L (6 to 8 US gal)</td>
<td>0.57 L (.60 qt)</td>
</tr>
<tr>
<td>30 to 38 L (8 to 10 US gal)</td>
<td>0.71 L (.75 qt)</td>
</tr>
<tr>
<td>38 to 49 L (10 to 13 US gal)</td>
<td>0.95 L (.95 qt)</td>
</tr>
<tr>
<td>49 to 64 L (13 to 17 US gal)</td>
<td>1.18 L (1.25 qt)</td>
</tr>
</tbody>
</table>

Table 74

For additional information on the addition of extender, see Special Publication, SEBU6250, “Cat Extended Life Coolant (ELC) Cooling System Maintenance” or consult your Caterpillar dealer.

**Cooling System Coolant Level - Check**

**SMCS Code:** 1350-535-FLV

**WARNING**

Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen the cap slowly to relieve the pressure.

Open the engine access door on the top of the hood.

1. The radiator cap is located on the top of the radiator on the left side of the machine. Slowly loosen the cap in order to relieve system pressure. Remove the radiator cap slowly.

2. Maintain the coolant level within 13 mm (0.5 inch) of the bottom of the filler tube. If you need to add coolant daily, check the cooling system for leaks.

3. Inspect the radiator cap seal. Replace the radiator cap seal if the radiator cap seal is damaged.

4. Install the radiator cap. Lower the tab on the radiator cap. Close the access panel.

**Cooling System Coolant Sample (Level 1) - Obtain**

**SMCS Code:** 1350-008; 1395-008; 7542

---

**NOTICE**

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

**Note:** Level 1 results may indicate a need for Level 2 Analysis.
Obtain the sample of the coolant as close as possible to the recommended sampling interval. In order to receive the full effect of S·O·S analysis, you must establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent samplings that are evenly spaced. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic bags.
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from expansion bottles.
- Never collect samples from the drain for a system.

Submit the sample for Level 1 analysis.

For additional information about coolant analysis, see Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” or consult your Caterpillar dealer.
Cooling System Water Temperature Regulator - Clean/Replace

SMCS Code: 1355; 1393

Replace the thermostat on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system. Failure to replace the engine’s thermostat on a regularly scheduled basis could cause severe engine damage.

The thermostat should be replaced after the cooling system has been cleaned. Replace the thermostat while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the thermostat housing.

Note: If you are only replacing the thermostat, drain the cooling system coolant to a level that is below the thermostat housing.

Caterpillar engines incorporate a shunt design cooling system. It is mandatory to always operate the engine with a thermostat.

1. Install the lift cylinder brace. Refer to Operation and Maintenance Manual, “Lift Cylinder Brace - Connect and Disconnect” for more information.

2. Remove the engine access panel on the right side of the machine.

3. Loosen the hose clamp and remove the hose from the thermostat housing assembly.

4. Remove the bolts from the thermostat housing assembly. Remove the thermostat housing assembly.

5. Remove the gasket, the thermostat, and the seal from the thermostat housing assembly.


The thermostats can be reused under the following conditions.

- The thermostat is tested and the thermostat meets test specifications.
- The thermostat is not damaged.
- The thermostat does not have excessive buildup of deposits.

7. Install the hose. Tighten the hose clamp.


Differential Oil (Front) - Change

SMCS Code: 3258

1. Remove oil drain plug (1) and drain the oil into a suitable container.

2. The drain plug is magnetic. Check the plug for metal.

3. Clean the drain plug and install the drain plug.

4. Remove oil level/fill plug (2).

5. Add oil until the oil is level with the threads for the filler plug. Refer to Operation and Maintenance Manual, “Lubricant Viscosities” and Operation and Maintenance Manual, “Capacities (Refill)” for oil.

6. Clean the filler plug and install the filler plug.
Differential Oil (Rear) - Change

SMCS Code: 3258

The oil change interval should be decreased to 500 hours if more than 50% of the service hours is used for roading and loading.

1. Remove oil drain plug (1) and drain the oil into a suitable container.
2. Clean the drain plug and install the drain plug.
3. Remove oil level/fill plug (2).
5. Clean the filler plug and install the filler plug.

Differential Oil Level (Front) - Check

SMCS Code: 3258

The oil level/fill plug is located near the middle of the front axle.

1. Remove the oil level/fill plug in order to check the oil.
2. The oil level should be at the bottom of the plug threads.
3. Clean the oil level/fill plug and install the oil level/fill plug.

Differential Oil Level (Rear) - Check

SMCS Code: 3258

The oil level/fill plug is located near the middle of the rear axle.

1. Remove the oil plug in order to check the oil.
2. The oil level should be at the bottom of the plug threads.
3. Clean the oil plug and install the oil plug.
**Differential Oil Sample (Front) - Obtain**

**SMCS Code:** 3258-008; 7542-008

Refer to the Operation and Maintenance Manual, "General Hazard Information" for information that pertains to containing fluid spillage.

Refer to the Special Publication, SEBU6250, “S·O·S Oil Analysis” for more information.

**Drive Shaft Spline - Lubricate**

**SMCS Code:** 3253

Access the grease fittings for the drive shaft spline from the bottom of the machine.

**Differential Oil Sample (Rear) - Obtain**

**SMCS Code:** 3258-008; 7542-008

Obtain the oil sample according to the Operation and Maintenance Manual, "Maintenance Interval Schedule".

Refer to the Special Publication, SEBU6250, “S·O·S Oil Analysis” for more information.

Apply lubricant to the grease fitting for the drive shaft spline of the front drive shaft.

Apply lubricant to the grease fitting for the drive shaft spline of the rear drive shaft.
Engine Air Filter Primary Element - Clean/Replace

SMCS Code: 1051; 1054

NOTICE
Service the air cleaner only with the engine stopped. Engine damage could result.

Service the air cleaner filter element when the yellow piston on the engine air filter service indicator enters the red zone or the indicator reads 63.5 cm (25 inch) of water. Refer to Operation and Maintenance Manual, “Engine Air Filter Service Indicator - Inspect”.

1. Open the engine access door on the top of the machine.

2. Remove cover (1) for the air filter housing.

3. Remove primary filter element (2) from the air filter housing.

4. Slide the primary filter element out of the filter base (3).

5. Clean the inside of the air filter housing.

6. Slide a clean primary air filter element into the filter base. Install the clean filter into the air filter housing. Install the cover for the air filter housing.

Note: Refer to “Cleaning Primary Air Filter Elements”.

7. Reset the engine air filter service indicator.

8. Close the access door.

If the yellow piston in the indicator moves into the red zone after starting the engine or the exhaust smoke is still black after installation of a clean primary filter element, install a new primary filter element. If the piston remains in the red zone replace the secondary element.

Cleaning Primary Air Filter Elements

NOTICE
Caterpillar recommends certified air filter cleaning services available at participating Caterpillar dealers. The Caterpillar cleaning process uses proven procedures to assure consistent quality and sufficient filter life.

Observe the following guidelines if you attempt to clean the filter element:

Do not tap or strike the filter element in order to remove dust.

Do not wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 207 kPa (30 psi). Direct the air flow up the pleats and down the pleats from the inside of the filter element. Take extreme care in order to avoid damage to the pleats.

Do not use air filters with damaged pleats, gaskets, or seals. Dirt entering the engine will cause damage to engine components.

The primary air filter element can be used up to six times if the element is properly cleaned and inspected. When the primary air filter element is cleaned, check for rips or tears in the filter material. Every two years replace the primary air filter element at least one time. This replacement should be performed regardless of the number of cleanings.

NOTICE
Do not clean the air filter elements by bumping or tapping. This could damage the seals. Do not use elements with damaged pleats, gaskets, or seals. Damaged elements will allow dirt to pass through. Engine damage could result.

Visually inspect the primary air filter elements before cleaning. Inspect the air filter elements for damage to the seal, the gaskets, and the outer cover. Discard any damaged air filter elements.

There are two common methods that are used to clean primary air filter elements:

• Pressurized air
• Vacuum cleaning

Pressurized Air

Pressurized air can be used to clean primary air filter elements that have not been cleaned more than two times. Pressurized air will not remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).

Note: When the primary air filter elements are cleaned, always begin with the clean side (inside) in order to force dirt particles toward the dirty side (outside).

Vacuum Cleaning

Vacuum cleaning is another method for cleaning primary air filter elements which require daily cleaning because of a dry, dusty environment. Cleaning with pressurized air is recommended prior to vacuum cleaning. Vacuum cleaning will not remove deposits of carbon and oil.

Inspecting the Primary Air Filter Elements

Inspect the clean, dry primary air filter element. Inspect the primary air filter element for tears and/or holes. If it is necessary in order to confirm the result, compare the primary air filter element to a new primary air filter element that has the same part number.

Do not use a primary air filter element that has any tears and/or holes in the filter material. Do not use a primary air filter element with damaged pleats, gaskets or seals. Discard damaged primary air filter elements.

Storing Primary Air Filter Elements

If a primary air filter element that passes inspection will not be used, the primary air filter element can be stored for future use.

Do not use paint, a waterproof cover, or plastic as a protective covering for storage. An air flow restriction may result. To protect against dirt and damage, wrap the primary air filter elements in Volatile Corrosion Inhibited (VCI) paper.

Place the primary air filter element into a box for storage. For identification, mark the outside of the box and mark the primary air filter element. Include the following information:

• Date of cleaning
• Number of cleanings

Store the box in a dry location.

Engine Air Filter Secondary Element - Replace

SMCS Code: 1051; 1054

NOTICE
Always replace the secondary filter element. Never attempt to reuse it by cleaning.

The secondary filter element should be replaced at the time the primary element is serviced for the third time. The secondary filter element should be replaced everytime the primary element is replaced.

The secondary filter element should also be replaced if the yellow piston in the filter element indicator enters the red zone after installation of a clean primary element, or if the exhaust smoke is still black.

1. Remove the air cleaner housing cover (1).
2. Remove the primary filter element (2) from the air cleaner housing.
3. Clean the inside of the air cleaner housing (4) with a wet rag before the secondary filter element (3) is removed.
4. Inspect the gasket between the air inlet pipe and the air cleaner housing. Replace the gasket if the gasket is damaged.
5. Install a new secondary element.
6. Install the primary element and the air cleaner housing cover. Fasten the clips in order to secure the air cleaner housing cover.
7. Reset the filter element indicator.
8. Close the engine access door.

**Engine Air Filter Service Indicator - Inspect**

**SMCS Code:** 1051; 1054; 7452

**NOTICE**

Service the air cleaner only with the engine stopped. Engine damage could result.

![Illustration 241](g01180675)

The filter service indicator is located under the engine access door in front of the housing for the air filter.

Start the engine. Run the engine at high idle. If the yellow piston in the filter service indicator enters the red zone, service the air cleaner. Stop the engine.

**Engine Air Precleaner - Clean**

**SMCS Code:** 1055-070

2. Remove the precleaner in order to clean the precleaner.

3. Use pressurized air to clean the tubes. Put the tubes on a flat surface. Direct the pressurized air into the tubes from the top. This loosens up the dirt.

   a. Loosen hard deposits of dust on the precleaner body by soaking in an appropriate cleaning agent. Then, wash the precleaner body with a spray of water.

   b. Blow dry the precleaner body completely.

4. Install the precleaner.

5. Install T-bolt (1). Hand tighten the T-bolt only.

6. Close the left engine access door.

**NOTICE**

Service the air cleaner only with the engine stopped. Engine damage could result.

**Engine Compartment - Clean**

**SMCS Code:** 1000-070

**NOTICE**

Before spraying the engine compartment with high pressure water turn off the engine and allow the engine to cool. Do not spray water directly on a hot fuel injection pump or damage may occur.

Use a commercially available engine degreaser in order to clean the engine compartment. Use caution and minimize the water around bearings and electrical connections.

1. Inspect the engine air precleaner for dirt and for trash.
Engine Crankcase Breather - Replace

**SMCS Code:** 1317-510

1. Loosen the clamp (9) and remove the hose (10) from the connector (12).

2. Remove the setscrews (8) and remove the connector (12) from the cylinder head. Remove the gasket (13). Remove the O-ring seal (11) from the connector. Discard the gasket (13) and the O-ring seal (11).

3. Remove the cover (1) from the valve mechanism cover (5).

4. Remove the screws (2). Remove the plate (3).

5. Remove the diaphragm (4) and the cap (6). Remove the spring (7). Discard diaphragm (4).

**WARNING**

Personal injury can result from parts and/or covers under spring pressure.

Spring force will be released when covers are removed.

Be prepared to hold spring loaded covers as the bolts are loosened.

6. Install the spring (7), the cap (6), and a new diaphragm (4).

7. Install the plate (3). Install the screws (2).

8. Install the cover (1) on the valve mechanism cover.


10. Install the setscrews (8). Tighten the setscrews to a torque of 9 N·m (80 lb in).

11. Install the hose (10) on the connector (12). Tighten the clamp (9) to a torque of 5 N·m (44 lb in).

**Engine Oil Level - Check**

**SMCS Code:** 1302; 1318; 1326

**NOTICE**

Do not overfill the crankcase. Engine damage can result.

1. Open the engine access door on the top of the machine.

2. While the engine is stopped, maintain the oil level between the “ADD” mark and the “FULL” mark on the engine oil dipstick (1).
3. If necessary, remove the oil filler cap (2) and add oil.

4. Clean the oil filler cap and install the oil filler cap.

5. Close the engine access door.

**Engine Oil Sample - Obtain**

**SMCS Code:** 1348-008; 7542-008

Use the sampling valve in order to obtain a sample of the engine oil. The sampling valve is located on the side of the engine next to the oil filter base. The engine must be running in order to take a sample of the engine oil.

Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”, “S·O·S Oil Analysis” for information that pertains to obtaining an oil sample. Refer to Special Publication, PEHP6001, “How To Take A Good Oil Sample” for more information about obtaining an oil sample.

**Engine Oil and Filter - Change**

**SMCS Code:** 1302; 1318; 1326

**Note:** If the sulfur content in the fuel is greater than 1.5% by weight, use an oil with a TBN of 30. With the high sulfur fuel, change the oil and the filter element after every 250 hours or after every month. If the API category is CF-4 or less, change the oil and change the filter element after every 250 hours or after every month. Otherwise, change the oil and the filter element after every 500 hours or after every three months.
Engine Valve Lash - Check

SMCS Code: 1102-082; 1102-535; 1102; 1209-082; 1209

Note: A qualified service person should perform the valve lash check and/or the valve lash adjustment. Special tools and training are required.

Refer to your machine's Service Manual for complete instructions.

Extendable Stick Pads - Inspect/Adjust (If Equipped)

SMCS Code: 6533-025; 6533-040

Note: The wear pads on the extendable stick are impregnated with a lubricant. The wear pads do not require the application of lubricant. Do not apply lubricant to the pads.

8. Remove the oil filler cap (2). Fill the crankcase with new oil. Refer to Operation and Maintenance Manual, “Lubricant Viscosities” and Operation and Maintenance Manual, “Capacities (Refill)”. Clean the oil filler cap and install the oil filler cap.

9. Start the engine and allow the oil to warm. Check for leaks.

10. Stop the engine and allow the oil to drain back into the oil pan. Maintain the oil level in the crosshatched region of the engine oil dipstick (1). Add oil, if necessary.

11. Replace the engine access panel and close the engine access door.

Engine Valve Lash - Check

SMCS Code: 1102-082; 1102-535; 1102; 1209-082; 1209

Note: A qualified service person should perform the valve lash check and/or the valve lash adjustment. Special tools and training are required.

Refer to your machine’s Service Manual for complete instructions.

Upper Wear Pad

1. Position the machine as shown in figure 249.

2. Raise the rear of the backhoe so that tires are 25.4 mm (1 inch) off of the ground.

3. Fully extend the stick. Then, retract the stick 76.2 mm to 101.6 mm (3 inch to 4 inch).

4. Pull stick in and position the rear bucket so that the bottom of the bucket and the bucket teeth are flat on the ground.

5. Fully extend the extendable stick. Lift the stabilizers off the ground.

6. Use a feeler gauge in order to measure the gap between wedge (1) and the bottom surface of the inner stick. The gap should be between 0.5 mm (0.0197 inch) and 1.0 mm (0.0394 inch).

7. Check for clearance on the upper wear pad. If the gap between the upper wear pad and the bottom surface of the inner stick is less than 0.5 mm (0.02 inch) proceed to Step 8, or more than 1 mm (0.04 inch) proceed to Step 9.
8. If the gap is less than 0.5 mm (0.0197 inch), perform steps 8.a through 8.i.
   a. Retract the extendable stick halfway.
   b. Loosen two bolts (3) that secure the upper wear pad (1) in place.

   **Note:** Do not loosen the two bolts that are under the setscrew.
   c. Loosen set screw (2) by two turns.
   d. Fully extend the stick. The upper wear pad should slide back to the stop.
   e. Return the machine to the position that is shown in figure 251.
   f. Turn the set screw counterclockwise in order to increase the gap.
   g. After you set the clearance, tighten bolts (3) in order to secure the upper wear pad.
   h. Measure the gap that is between the wedge and the bottom surface of the inner stick. If necessary, perform steps 8.a through 8.g.
   i. When the gap is correct, apply 154-9731 Thread Lock Compound to both bolts (3).
   j. Torque bolts (3) to 100 ± 20 N·m (74 ± 15 lb ft).
   k. Proceed to Step 10.

9. If the gap is more than 1.0 mm (0.0394 inch), perform steps 9.a through 9.e.
   a. Loosen two bolts (3) that secure the upper wear pad (1) in place.

   **Note:** Do not loosen the two bolts that are under the setscrew.
   b. Turn set screw (2) clockwise in order to decrease the gap.
   c. Tighten two bolts (3) in order to secure the upper wear pad.
   d. Measure the gap that is between the wedge and the bottom surface of the inner stick. If necessary, perform steps 9.a through 9.e.
   e. When the gap is correct, apply 154-9731 Thread Lock Compound.
   f. Torque bolts (3) to 100 ± 20 N·m (74 ± 15 lb ft).
   g. Proceed to Step 10.

10. Check extension of the stick after adjusting the upper wear pad.
   a. Set the stick horizontally to the ground.
   b. Extend the stick and retract the stick in order to check for any vibrations.
   c. If no vibration is evident, continue to “Inspect the Gap of the Lower Wear Pads”.
   d. If the vibration is evident, adjust the upper wear pad to the maximum gap of 1 mm (0.04 inch). If the vibration continues contact the Dealer Service Network (DSN).

   **Note:** A small amount of vertical movement of the outer slider is acceptable with a gap of 1 mm (0.04 inch).

**Inspect the Gap of the Lower Wear Pads**

1. Remove access plate (4) and remove the two caps for the access holes (5).
2. Position the machine. Refer to Illustration 253
3. Fully retract the extendable stick in order to allow access through the nose of the stick. Slightly lift the rear of the machine.
4. At access holes (5), measure the gap between the top of the flat wear pad that is bolted to the inner stick and the inside surface of the outer stick.
5. Check for clearance on the lower wear pad. If the gap between the lower wear pad and the bottom surface of the outer stick is less than 0.5 mm (0.02 inch) proceed to Step 6, or more than 1 mm (0.04 inch) proceed to Step 7.
6. If the gap is less than 0.5 mm (0.0197 inch), perform the following steps:
   a. Loosen the two bolts (6) that secure the lower wear pad in place.
   b. Turn set screw (7) counterclockwise by two turns.
   c. Slide the stick out 25 mm (1 inch) to 75 mm (3 inch).
   Note: The lower wear pad should return against the set screw. This will create a gap between the lower wear pad and the outer extendable stick.
   Note: Ensure that the wear pad is pulled back against the set screw. Tighten the bolts. Ensure that you can access the bolts after the stick has been extended by a few inches.
   d. Return the machine to the position that is shown in figure 253.
   e. Measure the gap and make any needed adjustments.
   f. If the gap is correct, apply 154-9731 Thread Lock Compound to both bolts (6).
   g. Torque the bolts (6) to 100 ± 20 N·m (74 ± 15 lb ft).
7. If the gap is more than 1.0 mm (0.0394 inch), perform steps:
   a. Loosen the two bolts (6) that secure the lower wear pad in place.
   Note: Do not loosen the two bolts that are under the setscrew.
   b. Turn set screw (7) clockwise in order to decrease the gap.
   c. Measure the gap and make any needed adjustments.
   d. If the gap is correct, apply 154-9731 Thread Lock Compound to both bolts (6).
   e. Torque the bolts (6) to 100 ± 20 N·m (74 ± 15 lb ft).

Checking Extension of the Stick
1. Set the stick so the stick is horizontal to the ground.
2. Extend and retract the extendable stick in order to check for any vibrations.
3. If no vibration is evident, proceed to “Adjustment of the Side Pad”.
4. If the adjustment of the wedge has been performed and vibration is evident proceed to “Adjustment of the Side Pad”.
**Note:** A small amount of vertical movement of the outer slider is acceptable with a gap of 1.0 mm (0.0394 inch).

### Adjustment of the Side Pad

1. Position the machine. Refer to Illustration 255.

2. Raise the rear of the backhoe and make sure that the boom nose is level with the ground. Fully extend the stick and place the curled bucket slightly off the ground.

3. Check for free play between the side wear pads and the inner section of the stick.

4. Check each side wear pad with the outer slider in the following positions.
   - Extended 50.8 mm (2 inch) to 76.2 mm (3 inch)
   - Half extended
   - Fully extended

5. Use a 0.25 mm (0.0098 inch) feeler gauge to check each side wear pad. One side should have no gap between the inner slider and the face of the pad (9). The other side should have a 0.25 mm (0.0098 inch) or less gap (8). See Illustration 257.

6. Ensure that a 0.25 mm (0.0098 inch) gap is present at the widest part of the three checked positions. This will be the position of the smallest gap between the inner slider and side wear pad. Setting the 0.25 mm (0.0098 inch) gap at a narrow point of the inner slider may allow vibrating as the wear pads travel over the wider points of the slider.

7. If adjustment is required, perform the following steps:
a. Remove the four hex socket screws (10) and the plate (11).

b. Apply an adequate number of shims in order to make the side lower wear pad flush with shims.

Note: The amount of shims should be equal on both sides within 0.5 mm (0.02 inch). The top side pad and bottom side pad do not need to have an equal number of shims.

c. Reassemble the cover (11) and torque the hex socket screws (10) to 50 ± 10 N·m (37 ± 7 lb ft).

d. Repeat steps for the remaining three additional side pads.

e. Proceed to Step 8.

8. Check extension of the stick after adjusting the side wear pads.

a. Set the stick horizontally to the ground.

b. Extend the stick and retract the stick in order to check for any vibrations.

c. If adjustment is too tight, then add a 0.5 mm (0.02 inch) shim to one of the side pads and recheck the adjustment.

Note: Choose a pad with the heaviest wear marks.

d. If adjustment is still too tight, then add a 0.5 mm (0.02 inch) shim to the corresponding pad on the other side and recheck the adjustment.

e. If adjustment continues to be too tight, then add a 0.5 mm (0.02 inch) shim to the remaining wear pads.

f. If the stick continues to vibrate, contact the DSN.

Final Drive Oil (Front) - Change

SMCS Code: 4050

1. Position the oil fill/drain plug at the bottom. Remove the oil fill/drain plug and drain the oil into a suitable container.

2. The plug is magnetic. The plug will attract metal from the oil. Check the plug for an increased amount of metal on the plug. If any abnormal particles are found, consult your Caterpillar dealer.

3. Position the plug hole at a horizontal position. Use the line on the final drive as a reference.
4. Add oil until the oil is level with the plug threads. Refer to Operation and Maintenance Manual, “Lubricant Specifications” and Operation and Maintenance Manual, “Capacities (Refill)” for the oil.

5. Clean the plug and install the plug.

6. Repeat the procedure for the other final drive.

Final Drive Oil Level (Front) - Check

SMCS Code: 4050

1. Position the oil fill/drain plug at a horizontal position in order to check the oil level.

2. Remove the oil fill/drain plug in order to check the oil level.

3. The oil should be level with the bottom of the plug threads.

4. The plug is magnetic. Check the plug for metal. Clean the plug and install the plug.

5. Repeat the procedure for the other final drive.
Final Drive Oil Level (Rear) - Check

SMCS Code: 4050

1. Position the oil fill/drain plug at a horizontal position in order to check the oil level.
2. Remove the oil fill/drain plug in order to check the oil level.
3. The oil should be level with the bottom of the plug threads.
4. Clean the plug and install the plug.
5. Repeat the procedure for the other final drive.

Final Drive Oil Sample (Rear) - Obtain

SMCS Code: 4050-008-RE; 7542-008

Obtain the oil sample from the fill/drain plug. Refer to Special Publication, SEBU6250, “S-O-S Oil Analysis” for information that pertains to obtaining a sample of the engine oil. Refer to Special Publication, PEHP6001, “How To Take A Good Oil Sample” for more information about obtaining a sample of oil.

Final Drive Oil Sample (Front) - Obtain

SMCS Code: 4050-008-FR; 7542-008

Obtain the oil sample from the fill/drain plug. Refer to Special Publication, SEBU6250, “S-O-S Oil Analysis” for information that pertains to obtaining a sample of the engine oil. Refer to Special Publication, PEHP6001, “How To Take A Good Oil Sample” for more information about obtaining a sample of oil.

Fuel System Filter and Water Separator - Replace

SMCS Code: 1261-510; 1263-510-FQ

Some fuel supplies may not meet the minimum standard for fuel lubricity. Caterpillar recommends the use of fuels that meet certain minimum specifications. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

NOTICE

It is extremely important to drain water from the water separator daily, or every ten hours. It is also extremely important to drain water from the fuel tank weekly, or every 50 hours. Failure to do so could result in damage to the fuel system.
1. Install the lift cylinder brace. Refer to Operation and Maintenance Manual, “Lift Cylinder Brace - Connect and Disconnect” for more information.

2. Remove the access panel from the left side of the machine.

   The machine uses a fuel filter with a push and twist collar.

   **Note:** The primary fuel filter is a reverse flow filter. When you service the machine, the proper filter must be used.

3. Remove sensor (2) and the wire from the bottom of the filter.

4. Remove primary fuel filter (1) that is located next to the engine oil filter under the left side of the machine. Rotate the locking ring counterclockwise in order to remove the filter element. Discard the filter properly.

5. Clean the filter element mounting base. Remove any part of the filter element gasket that remains on the filter element mounting base.

6. Coat the seal of the new filter element with clean diesel fuel.

7. Install the new fuel filter by hand.

   Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

8. Install the sensor and the wire into the new filter.

9. Replace the access panel.

### Fuel System Secondary Filter - Replace

**SMCS Code:** 1261-510-SE

**S/N:** FSH1-Up

**S/N:** HLS1-Up

**S/N:** DDT1-Up

**S/N:** EAT1-Up

**S/N:** KMW1-Up

**NOTICE**

Do not fill the secondary fuel filter with fuel before installing. The fuel would not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

**NOTICE**

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

**Note:** The secondary fuel filter is a standard flow filter. When you service the machine, the proper filter must be used.

**Note:** Before you replace the secondary fuel filter, the primary fuel filter must be replaced. Refer to the Operation and Maintenance Manual, “Fuel System Filter and Water Separator - Replace”.

1. Park the machine on a level surface. Ensure that the parking brake is fully engaged.
2. Use a strap wrench and remove the secondary fuel filter. Discard the secondary fuel filter properly.

3. Clean the fuel filter base.

4. Coat the seal for the new secondary fuel filter with clean diesel fuel prior to installation.

5. Install the new secondary fuel filter by hand.

   Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

6. Start the engine and check for leaks.

**Fuel System Water Separator - Drain**

**SMCS Code:** 1263-543; 1263

Some fuel supplies may not meet the minimum standard for fuel lubricity. Caterpillar recommends the use of fuels that meet certain minimum specifications. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

**NOTICE**

It is extremely important to drain water from the water separator daily, or every ten hours. It is also extremely important to drain water from the fuel tank weekly, or every 50 hours. Failure to do so could result in damage to the fuel system.

The water separator is located by the drain plug for the engine crankcase.

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**Fuel Tank Water and Sediment - Drain**

**SMCS Code:** 1273-543-M&S

Some fuel supplies may not meet the minimum standard for fuel lubricity. Caterpillar recommends the use of fuels that meet certain minimum specifications. Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”.

**NOTICE**

It is extremely important to drain water from the water separator daily, or every ten hours. It is also extremely important to drain water from the fuel tank weekly, or every 50 hours. Failure to do so could result in damage to the fuel system.

The fuel tank is located on the left side of the machine.
Flip up the tab on the fuel cap. Turn the tab counterclockwise on the fuel cap and slowly remove the fuel tank cap (2) in order to relieve pressure.

The fuel tank drain valve (1) is located on the lower right corner on the front of the fuel tank. Loosen the fuel tank drain plug until the water flows. Allow the water and sediment to drain into a suitable container. Install the fuel tank drain plug. Replace the fuel tank cap.

**Fuses - Replace**

**SMCS Code: 1417**

Fuses protect the electrical system from damage that is caused by overloaded circuits. Replace the fuse if the element separates. If the element of a new fuse separates, check the circuit. Repair the circuit, if necessary.

**NOTICE**

Replace the fuses with the same type and size only. Otherwise, electrical damage can result.

If it is necessary to replace fuses frequently, an electrical problem may exist. Contact your Caterpillar dealer.

**Backup Alarm (1) – Relay**

**Power Port (2) – 10 Amp**

**Machine ECM (3) – 20**

**Backup Alarm (4) – 15 Amp**

**Roading Lights (5) – 20 Amp**

**Flasher Module (6) – 15 Amp**

**Engine Stop (7) – 10 Amp**

**Horn and Position Lights (8) – 15 Amp**

**Rear Window Wiper and Washer (9) – 20 Amp**

**Laser Mast (10) – 20 Amp**
Maintenance Section
Hydraulic Oil Sample - Obtain

Rear Floodlights (11) – 15 Amp
Auxiliary Rear Floodlights (12) – 15 Amp
Air Seat (13) – 20 Amp
Left Tail Light (14) – 10 Amp
Dash Panel Lights (15) – 10 Amp
Right Tail Light (16) – 10 Amp
Horn (17) – Relay
Tail Lights (18) – Relay

Ride Control and Hydraulic Lockout (30) – 20 Amp

Hydraulic Oil Sample - Obtain

SMCS Code: 5050-008; 7542-008

Obtain a sample of the hydraulic oil from the hydraulic quick disconnect fitting that is located on the hydraulic oil filter housing. The hydraulic oil filter housing is located near the rear axle.

1. Turn off the engine.

WARNING

Taking oil samples under a running machine may cause personal injury or death. The use of a sample tube allows an oil sample to be taken while the person is outside of the tread path of the tires. The sample tube should be attached to the sample port when the machine is not running. The oil sample should then be taken only when the following conditions exist:

- The machine transmission is in NEUTRAL.
- The parking brake is applied.
- The swing lock pin is engaged.
- All implements are lowered to the ground.
- The hydraulic lockout switch (if equipped) is applied.

2. Attach a hose with a female quick disconnect fitting to the hydraulic quick disconnect fitting.

Note: Ensure that all personnel are clear of the machine before starting the engine.
3. Turn the engine start switch in order to start the engine.

4. Use the hose in order to obtain a sample of the hydraulic oil.

**Note:** Allow oil to pass through the hose for 10 seconds before obtaining the sample in order to ensure that no contaminants are in the oil sample.

5. Turn off the engine.

6. Remove the hose that was used to obtain the oil sample.

Refer to Special Publication, SEBU6250, “S·O·S Oil Analysis” for information that pertains to a sample of the hydraulic oil. For additional information about taking an oil sample, refer to Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

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### Hydraulic System Oil - Change

**SMCS Code:** 5056

**Note:** The normal hydraulic oil change interval is at every 2000 Service Hours or 1 Year. By performing S·O·S oil analysis, the hydraulic oil change interval may be extended to 4000 Service Hours or 2 Years. S·O·S oil analysis must be performed at every 500 Service Hours or 3 Months in order to extend the hydraulic oil change interval. The results from the S·O·S oil analysis will determine if the hydraulic oil change interval may be extended. If S·O·S oil analysis is not available, the hydraulic oil change interval must remain at every 2000 Service Hours or 1 Year. Refer to the Operation and Maintenance Manual, “S·O·S Information”.

**Note:** Cat HYDO Advanced 10 has a 50% increase in the standard oil drain interval for machine hydraulic systems (3000 hours versus 2000 hours) over second and third choice oils - when following the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual for your particular machine. 6000 hour oil drain intervals are possible when using S·O·S Services oil analysis. Contact your Cat dealer for details.

Operate the machine for a few minutes in order to warm the hydraulic system oil.

The machine should be level. Lower the bucket to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.

5. Inspect the hydraulic tank breather that is located on a hose from the overflow container. Replace the breather, if necessary.


7. Maintain the hydraulic oil level in the sight gauge between the “MIN” mark and the “MAX” mark.

   Check the hydraulic oil level with the loader on the ground and with the backhoe in the transport position.

   **Note:** The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the suction hoses and hose clamps.

8. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the gasket, if necessary.

9. Install the hydraulic tank filler cap.

10. Close the access door.

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**Hydraulic System Oil Filter - Replace**

**SMCS Code:** 5056; 5068

1. Open the engine access door on the top of the machine.

2. Remove the hydraulic tank filler cap that is located under the access panel on the top of the engine compartment.

3. Remove the filter element with a strap type wrench.

4. Clean the filter element mounting base. Remove any part of the filter element gasket that remains on the filter element mounting base.

5. Apply a light coat of oil to the gasket of the new filter element.

6. Install the new oil filter by hand.

   Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

7. Remove the hydraulic tank breather. Replace the old breather with a new breather.
8. Maintain the hydraulic oil level in the sight gauge between the “MIN” mark and the “MAX” mark. Add oil, if necessary.

9. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the gasket, if necessary.

10. Install the hydraulic tank filler cap.

11. Close the access door.

Hydraulic System Oil Level - Check

SMCS Code: 5056; 7479

The sight gauge for the hydraulic tank is located on the left side of the machine. Move the backhoe to the transport position and lower the loader bucket to the ground.

Turn off the engine. Wait about five minutes before you check the hydraulic system oil level.

Maintain the oil level in the sight gauge between the “MIN” mark and the “MAX” mark.

Loader Bucket, Cylinder, and Linkage Bearings - Lubricate

SMCS Code: 7069; 7070; 7071

Single Tilt Machines

Apply lubricant to the grease fittings (1) for the frame and for the lift arm. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fitting (2) for the pivot for the linkage of bucket positioner and lift kickout.

Apply lubricant to the grease fittings (3) for the rod end of the lift cylinder. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (4) for the pivot pin at the loader lift arm. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (5) for the pivot bearings for the bucket tilt cylinder. There is a grease fitting in each linkage (four total).

Apply lubricant to the grease fitting (6) for the rod end of the tilt cylinder.

Apply lubricant to the grease fittings (7) for the upper pivot pin. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (8) for the lower pivot pins. There is a grease fitting for each side of the machine.
Apply lubricant to the grease fitting (9) for the pivot for the linkage of bucket positioner and lift kickout.

Apply lubricant to the grease fittings (10) for the head end of the lift cylinder. There is a grease fitting for each side of the machine.

There is a total of 18 grease fittings.

Open the engine access door on the top of the machine.

Illustration 284

Apply lubricant to the grease fitting for the pivot point for the lift arms.

**Parallel Lift Machines**

Apply lubricant to the grease fittings (2) for the frame and for the parallel linkage. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (3) for the head end of the tilt cylinder. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (4) for the center pivot pin of the parallel linkage. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (5) for the lower pivot pin of the parallel linkage. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (6) for the rod end of the lift cylinder. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (7) for the upper pivot pin of the tilt linkage. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (8) for the upper pivot pin of the quick coupler assembly. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (9) for the lower pivot pin of the quick coupler assembly. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (10) for the lower pivot pin of the tilt linkage. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (11) for the rod end of the lift cylinder. There is a grease fitting for each side of the machine.

Apply lubricant to the grease fittings (12) for the head end of the lift cylinder. There is a grease fitting for each side of the machine.

There is a total of 24 grease fittings.
**Multi Purpose Bucket**

Apply lubricant to the grease fittings (1) for the rod end of the lift cylinder. There is a grease fitting for each side of the bucket.

Apply lubricant to the grease fittings (2) for the head end of the lift cylinder. There is a grease fitting for each side of the bucket.

Apply lubricant to the grease fittings (3) for the bucket hinge pin. There is a grease fitting for each side of the bucket.

There is a total of six grease fittings.

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**Oil Filter - Inspect**

**SMCS Code:** 1318; 3067; 5068

**Inspect a Used Filter for Debris**

Use a filter cutter to cut the filter element open. Spread apart the pleats and inspect the element for metal and for other debris. An excessive amount of debris in the filter element can indicate a possible failure.

If metals are found in the filter element, a magnet can be used to differentiate between ferrous metals and nonferrous metals.

Ferrous metals can indicate wear on steel parts and on cast iron parts.

Nonferrous metals can indicate wear on the aluminum parts of the engine such as main bearings, rod bearings, or turbocharger bearings.

Small amounts of debris may be found in the filter element. This could be caused by friction and by normal wear. Consult your Caterpillar dealer in order to arrange for further analysis if an excessive amount of debris is found.

Using an oil filter element that is not recommended by Caterpillar can result in severe engine damage to engine bearings, to the crankshaft, and to other parts. This can result in larger particles in unfiltered oil. The particles could enter the lubricating system and the particles could cause damage.

**Parking Brake - Check/Adjust**

**SMCS Code:** 4267

**Check Procedure**

Check the area around the machine. Make sure that the machine is clear of personnel and clear of obstacles.

Check the brakes on a dry, level surface.

Fasten the seat belt before you check the brakes.

The following checks are used to determine if the parking brake is functional. These checks are not intended to measure the maximum brake holding effort. The brake holding effort that is required to sustain a machine at a specific engine rpm varies depending on the machine. The variations are the differences in the engine setting, in the power train efficiency, and in the brake holding ability, etc.

1. Start the engine. Raise the bucket slightly.
2. Engage the parking brake.

3. If the machine is equipped with the direct drive transmission, move the transmission speed shift lever to THIRD gear. Move the transmission direction control lever to FORWARD, to NEUTRAL, and back to FORWARD. If the machine is equipped with a power shift transmission move the transmission control lever to THIRD SPEED FORWARD, to NEUTRAL, and back to THIRD SPEED FORWARD. This is done in order to override the transmission neutralizer for this test.

Note: Place machines that are equipped with all wheel drive into two-wheel drive mode.

Note: The parking brake indicator light should come on and the parking brake alarm should sound.

4. Gradually increase the engine speed to high idle. The machine should not move.

**WARNING**

If the machine begins to move, reduce the engine speed immediately and apply the service brake pedal.

5. Reduce the engine speed. Move the transmission to NEUTRAL. Lower the bucket to the ground. Stop the engine.

**Adjustment Procedure**

If the machine moved during the test, perform the following procedure in order to adjust the parking brake.

1. Apply the service brakes.

2. Disengage the parking brake.

3. As you view the parking brake adjuster knob from the operator seat, turn the knob clockwise for one half of a turn.

4. Repeat steps 1 to 5 in the check procedure.

If the machine moves during the parking brake test, then perform the adjustment procedure again. If you run out of adjustment on the parking brake adjuster knob, refer to Systems Operation, Testing and Adjusting, “Parking Brake Control - Adjust” for your machine.

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**Power Sideshift Stabilizer Wear Pads - Inspect (If Equipped)**

**SMCS Code:** 7222-040-JP

S/N: BXE1-Up

S/N: LBE1-Up

S/N: FSH1-Up

S/N: GKZ1-Up

1. Inspect eight pads (2). There are four pads on each end of link (1). The minimum thickness for pads (2) is 9.5 mm (0.37 inch).

2. Inspect four pads (3). There are two pads on each side of the slide frame. The minimum thickness for pads (3) is 12.5 mm (0.49 inch).

3. If replacement of the pads is required, please see your Caterpillar dealer.
Radiator Core - Clean

SMCS Code: 1353

Illustration 290

NOTICE
Do not spray high pressure water into the radiator while the engine is running.

You can use compressed air, high pressure water, or steam to remove dust and other debris from the radiator fins. However, the use of compressed air is preferred.

Note: If necessary, tilt the oil cooler away from the radiator in order to remove dust and debris between the radiator and the oil cooler.

Note:

Receiver Dryer (Refrigerant) - Replace

SMCS Code: 7322-710

**WARNING**

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.

NOTICE
If the refrigerant system has been open to the outside air (without being plugged) for more than 30 minutes, the receiver-dryer must be replaced. Moisture will enter an open refrigerant system and cause corrosion which will lead to component failure.

Refer to Service Manual, SENR5664, “Air Conditioning and Heating System with R-134a Refrigerant for All Caterpillar Machines” for the proper procedure to change the receiver-dryer assembly and for the procedure to reclaim the refrigerant gas.
Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7325

1. Inspect the ROPS for loose bolts or for damaged bolts. Replace any damaged bolts or missing bolts with original equipment parts only.

   Tighten the M20 bolts (1) to a torque of 460 ± 60 N·m (339 ± 44 lb ft). Tighten the M16 bolts (2) to a torque of 240 ± 40 N·m (177 ± 30 lb ft).

   **Note:** Apply oil to all ROPS bolt threads before you install the bolts. Failure to apply oil to the bolt threads can result in improper bolt torque.

2. Operate the machine on a rough surface. Replace the ROPS mounting supports if the ROPS emits a noise. Replace the ROPS mounting supports if the ROPS rattles.

   Do not straighten the ROPS. Do not repair the ROPS by welding reinforcement plates to the ROPS.

   Consult your Caterpillar dealer for repair of any cracks in the ROPS.

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Seat Belt - Inspect

SMCS Code: 7327-040

Always check the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine. Replace any parts that are damaged or worn before you operate the machine.

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Seat Belt - Replace

SMCS Code: 7327-510

Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.
Sideshift Stabilizer Wear Pads - Inspect/Adjust


1. Lower the stabilizers until the feet are just above the ground.

2. Check the stabilizer legs for movement in both directions. Maximum free play is 1 mm (0.0394 inch). If adjustment is needed, perform the following steps:
   a. Remove two bolts (3).
   b. Remove plate (2).
   c. Remove shims (1) in order to maintain maximum free play.
   d. Replace plate (2) and bolts (3).

3. Repeat steps 2.a through 2.d for the remaining wear pads.

4. Fully retract the stabilizers before moving the machine.

The stabilizer pads do not normally require any lubrication. If the stabilizers become noisy, a small amount of a silicone based lubricant may be applied.

Note: Do not apply an excessive amount of a silicone based lubricant. Dirt can be attracted to the lubricant and dirt can cause abrasion to the pad assemblies and wear to the pad assemblies.

Stabilizer - Clean/Inspect

SMCS Code: 7222-040; 7222-070

1. Lower the stabilizer legs.
2. Inspect the inner leg through the slot in the leg.
3. Remove excessive debris with pressurized water. Remove dry debris with a long tool.

Stabilizer and Cylinder Bearings - Lubricate

SMCS Code: 5468; 7222
S/N: HLS1-Up
S/N: DDT1-Up
S/N: EAT1-Up
S/N: KMW1-Up

Position the stabilizer, as shown.

Apply lubricant to the grease fitting for the head end of the cylinder and the rod end of the cylinder.
Repeat for the other stabilizer.
There is a total of four grease fittings.

Swing Frame and Cylinder Bearings - Lubricate

SMCS Code: 5105; 6506; 6507; 7063

Apply lubricant to the grease fitting (1) for the boom lock. Repeat for the opposite side.
Apply lubricant to the grease fittings (2) for the bearing on the top of the swing cylinders.
Apply lubricant to the grease fitting (3) for the bearing on the bottom of the swing cylinder. Repeat for the other swing cylinder.
Apply lubricant to the grease fitting (4) for the top swing pin.
Apply lubricant to the grease fitting (5) for the bottom swing pin.
Apply lubricant to the grease fitting (6) for the eye of the swing cylinder. Repeat for the other swing cylinder.
There is a total of ten grease fittings.

Tire Inflation - Check

SMCS Code: 4203

Measure the tire pressure on each tire. Tire inflation pressures for each application may vary. These tire inflation pressures should be obtained from your tire supplier.

Inflate the tires, if necessary. Refer to Operation and Maintenance Manual, “Tire Inflation with Air”.

The operating pressure is based on the following conditions.
Transmission Magnetic Screen - Clean

SMCS Code: 3030

1. Drain the transmission oil. Refer to Operation and Maintenance Manual, “Transmission Oil - Change”.

Illustration 300
Magnetic strainer cover for the standard transmission

Illustration 301
Magnetic strainer cover for the power shift transmission

2. Remove the magnetic strainer cover.

3. Remove the magnets from the housing.

4. Remove the screen from the housing.

5. Wash the tube and the screen in a clean, nonflammable solvent.

NOTICE
Do not drop or rap the magnets against any hard objects. Replace any damaged magnets.

6. Clean the magnets with a cloth, with a stiff bristle brush, or with pressure air.

7. Install the magnets and the tube assembly into the magnetic screen.

8. Install the magnetic screen.

9. Clean the cover and inspect the seal. Replace the seal, if the seal is damaged.

10. Install the cover. Tighten the cover bolts.

11. Fill the transmission. Refer to Operation and Maintenance Manual, “Transmission Oil - Change”.

Transmission Oil - Change

SMCS Code: 3030; 3080

Operate the machine for a few minutes in order to warm the transmission oil.

The machine should be level. Lower the bucket to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.
1. Remove the transmission drain plug. Allow the transmission oil to drain into a suitable container. Clean the transmission drain plug and install the transmission drain plug.

2. Change the transmission oil filter element. Refer to Operation and Maintenance Manual, “Transmission Oil Filter - Replace”.


4. Remove the transmission breather from the top of the transmission case. Clean the breather in clean nonflammable solvent and allow the breather to dry. Replace the breather.

5. Open the engine access door on the top of the machine.


7. Start the engine and run the engine at low idle. Apply the service brake. Slowly operate the transmission controls in order to circulate the oil.

8. Move the transmission control lever to NEUTRAL and engage the parking brake. Inspect the transmission for leaks.

9. Maintain the transmission oil level within the crosshatched region on the “CHECK WITH OIL WARM” side of the dipstick when the transmission is warm. Add transmission oil through the transmission filler tube, if necessary.

Note: The transmission can be checked with cold transmission oil. Ensure that the oil level is within the crosshatched region on the “Safe to Start” side of the dipstick/fill plug. Add transmission oil, if necessary.

10. Install the dipstick/fill cap and install the engine access door.

11. Stop the engine.

Transmission Oil Filter - Replace

SMCS Code: 3067

The transmission filter is located on the left side of the machine.
1. Remove the transmission oil filter element with a strap type wrench.

2. Clean the filter element mounting base. Remove any part of the filter element gasket that remains on the filter element mounting base.

3. Apply a light coat of oil to the gasket of the new filter element.

4. Install the new oil filter by hand.

Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

5. Start the engine and apply the service brake. Slowly operate the transmission controls in order to circulate the transmission oil.

6. Move the transmission control lever to NEUTRAL and engage the parking brake. Inspect the filter element for leaks.

7. Check the transmission oil level. Refer to Operation and Maintenance Manual, “Transmission Oil Level - Check” for more information.

8. Stop the engine.

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Transmission Oil Level - Check

**SMCS Code**: 3030; 3080; 3081

Check the transmission oil level while the machine is on a level surface. The loader should be resting on the ground.

1. Open the engine access door on the top of the machine.

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2. Remove the dipstick/fill plug for the transmission.

3. Ensure that the oil level is within the crosshatched region on the “Safe To Start” side of the dipstick/fill plug. Add transmission oil, if necessary.

4. Start the engine. Run the engine for 5 minutes.

5. Maintain the oil level within the crosshatched region on the “CHECK WITH WARM OIL” side of the dipstick/fill plug when the transmission is warm and the engine is at low idle. Add transmission oil, if necessary.

6. Clean the dipstick/fill plug and install the dipstick/fill plug.
Transmission Oil Sample - Obtain

SMCS Code: 3030-008; 7542-008

NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, “Caterpillar Dealer Service Tool Catalog” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

**WARNING**

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact skin.

Obtain a sample of the transmission oil from the transmission oil filler tube.

Refer to Special Publication, SEBU6250, “S·O·S Oil Analysis” for information that pertains to obtaining a sample of the transmission oil. Refer to Special Publication, PEHP6001, “How To Take A Good Oil Sample” for more information about obtaining a sample of the transmission oil.

Wheel Bearings (Front) - Lubricate
(Two-Wheel Drive)

SMCS Code: 4205; 4208

Use the following procedure for both wheels.

1. Raise the front wheels slightly off the ground.

2. Install sufficient blocking under the frame and lower the machine to the blocking.

3. Remove the nuts and both wheels.

4. Remove the dust cap (1).

5. Remove bolts (2) and retaining plate (3).

6. Pull the hub assembly (4) until the cone and roller assembly come out of the hub assembly. Then, pull off the hub all the way.

7. Clean all of the parts in clean, nonflammable solvent and allow the parts to air dry. Do not use pressure air.

8. Inspect the roller assemblies for heat discoloration and for wear. Inspect the seals for damage. Replace any damaged parts.

9. Make sure that the grease gets packed between the rollers and the cage on both bearings.

   Force the grease through the bearing from the large end of the rollers.

10. Pack a 6 mm (0.25 inch) layer of grease between the bearing assemblies in the hub. Do not pack the hub fully with grease.

11. Apply a 6 mm (0.25 inch) thick film of grease on the spindle surface.
12. Install the hub, the bearings, the washer, the nut and the wheel.

13. While you turn the wheel, tighten bolt (2) until a slight drag is noticed.

14. All bearing surfaces must make contact. The wheel should turn freely within 0.025 to 0.25 mm (0.001 to 0.010 inch) end play.

15. Install the dust cap.

**Wheel Nut Torque - Check**

**SMCS Code:** 4051; 4199; 4200

The washer fluid bottle is located in the engine compartment.

Check the torque on new wheels or repaired wheels after every ten service hours until the specified torque is maintained.

The nut and the stud should be clean and dry for reassembly. Apply one drop of lubricating oil to the stud before installing the nut onto the stud.

Torque the nuts to 460 ± 60 N·m (339 ± 44 lb ft). Use a star pattern when you torque the nuts.

Check the nuts on all four wheels.

**Window Wipers - Inspect/Replace**

**SMCS Code:** 7305

Inspect the condition of the wiper blades. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

**Windows - Clean**

**SMCS Code:** 7310; 7340

Use commercially available window cleaning solutions in order to clean the windows. Clean the outside of the windows from the ground, unless handholds are available.

NOTICE

When operating in freezing temperatures, use Caterpillar or any commercially available nonfreezing window washer solvent.
Illustration 313

Typical example

Use a pole with a squeegee in order to reach the high areas of the window.

**Cleaning Methods**

**Aircraft Windshield Cleaner**

Apply the cleaner with a soft cloth. Rub the window with moderate pressure until all the dirt is removed. Allow the cleaner to dry. Wipe off the cleaner with a clean soft cloth.

**Soap and Water**

Use a clean sponge or a soft cloth. Wash the windows with a mild soap or with a mild detergent. Also use plenty of lukewarm water. Rinse the windows thoroughly. Dry the windows with a moist chamois or with a moist cellulose sponge.

**Stubborn Dirt and Grease**

Wash the windows with a good grade of naphtha, of isopropyl alcohol, or of Butyl Cellosolve. Then, wash the windows with soap and with water.